REMARKS

Claims 18-37 are pending in the current application. In the above amendments, Applicant's representative has corrected a number of typographical errors and minor omissions in the originally filed specification and drawings. In an Office Action dated October 11, 2005, the Examiner allowed claims 28-34, 36, and 37, rejected claims 18-21, 25-27 under 35 U.S.C. 102(b) as being anticipated by Colak, U.S. Patent No.5,706,404, indicated that claims 22-24 would be allowable if rewritten in independent form, and rejected claim 35 as being indefinite under 35 U.S.C. 112.

Applicant's representative has amended claim 35. Applicants' representative wishes to thank the Examiner for allowing claims 28-34, 36, and 37 and the conditional allowance of claims 22-24, but defers rewriting claims 22-24 in independent form until the Examiner has had a chance to consider and respond to Applicants' representative's arguments, below. Applicants' representative respectfully traverses the 35 U.S.C. § 102(b) rejection of claims 18-21, 25-27.

Colak discloses a neural net for processing information. The neural net is composed of an input means that receives a number of input signals, an output means that outputs one or more output signals, and a physical medium between the input means and the output means that implements a neural transformation of the input signals. In response to the input signals, the physical medium propagates a response field throughout the medium. The physical medium produces an output signal by coupling the response field to the output means. The output signals are a set of one or more continuous response currents that flow out from the output means. Colak also discloses including an encoding means to deal with a response field that is substantially monotonic. The encoding means couples the physical medium to the output means. In order to implement the encoding means, one or more additional response fields are generated. The encoding operation may include determining a difference between a pair of response fields, a ratio of a response field and aggregate sum of response fields, or change of response field brought about by a change of a particular one of the input signals.

One embodiment of the current invention is directed towards a method for quantum computing. Data, a program, and uninitialized variables, or program output

is provided as input. The program is a form of discrete data. A compiler program converts the source code into an assembly code of computable functions. The computable functions are encoded by an encoding function. A continualization method is employed to produce a first-order, time-dependent, differential equation from the encoded functions. The variational principle is used to construct a Lagrangian whose minimum geodesic is the solution for the first-order, time-dependent, differential equation. The Lagrangian is converted into a quantum, canonical, Hamiltonian operator that includes differential operators and is realized as an excitation field produced by an excitation generator. A control and scheduling system is employed to moderate the intervals between discrete applications of the excitation field produced by the excitation generator. The excitation field is repeatedly applied to a quantum processor consisting of a lattice of polymer nodes. The light radiation emitted by the quantum processor lattice of polymer nodes is converted by a transducer into an intensity-versus-vibrational-frequency spectrum. A running average of the intensity-versus-vibrational-frequency spectrum is maintained in coherent memory. The average spectrum intensity values are used as coefficients in a polynomial approximation of the encoding function. The output consists of the original data and program, and substantiated variables, or program output.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The Colak reference suggested by the Examiner neither expressly nor inherently describes each and every element as set forth in independent claim 18. Please consider claim 18 provided below:

> 18. A method for computing a value, the method comprising:
> providing data, a program of computable functions to describe computation of the value to be computed, and one or more uninstantiated variables;
> encoding the program as a computable function;
> continualizing the encoded program;
> expressing the continualized, encoded program as a differential operator;
> realizing the differential operator in a physical medium;
> extracting from the physical medium a solution for the continualized, encoded program; and

outputting values for the one or more instantiated variables.

The Examiner asserts that the claim element directed to "continualization" is inherently described in column 2 lines 37-47 of Colak, which states "the operation of encoding may involve, for example, a difference between a pair of responses, a ratio of a respective response and an aggregate sum of responses, or a change of a respective response brought about by a change of a particular one of the input signals." Colak's neural net performs arithmetic operations on continuous signals in order to generate continuous response fields that are used to generate a continuous output signal. These arithmetic operations described in lines 37-47 do not represent any kind of continualization. In fact, continualization is neither expressly nor inherently described anywhere in the Colak reference. Continualization is described in paragraphs [0070]-[0094] of the current application as a mathematical method of transforming a discrete function into a continuous function by introducing a continuous variable t so that continuous mathematical methods can be applied to the resulting continuous function. Colak does not mention or suggest discrete input, output, or intermediate values. Thus, Colak does not mention or suggest continualization and has no use for continualization.

The Examiner asserts that the claim element directed to "encoding" is expressly or inherently described in column 2 lines 37-47 of Colak. In lines 37-47, Colak is referring to an encoding operation performed on the response fields generated by the physical medium, which is not the same as the encoding referred to in claim 18 of the current application. The encoding operation described in Colak is performed on continuous response fields in order to obtain continuous output signals. By contrast, the encoding in claim 18 of the current invention is a mathematical operation that maps the discrete representation of the program to a discrete set of the real numbers that represents a computable function. Colak does not mention or suggest encoding a discrete representation of a program into a computable function.

The Examiner asserts that the claim element "expressing the continualized, encoded program as a differential operator" is expressly or inherently described in column 10 lines 63-65, which states that "FIG. 10 gives a Table II giving the differential values between current I2 and I1, and between currents I3 and I5." The term "differential values" is not the same as the term "differential operator" used in

claim 18 of the current reference. The differential values displayed in Table II of Colak are in reference to the currents flowing out from the output means and are determined by subtracting a first current value from a second current value. For example, the differential value 4.3 mA in the left-most entry of the top row of Table II in FIG. 10 of Colak could have been determined by subtracting the first current value 4.1 mA from the second current value 8.4 mA. By contrast, the term "differential operator" in claim 18 of the current application is a mathematical operation in differential calculus, which is not the same as arithmetic subtraction as described in Colak. A differential operator is mathematically distinct and different from subtraction. From differential calculus:

$$\frac{d}{dx}$$

is an example of a differential operator that operates on functions of the variable x, such as x^5 and $\sin(x)$. The differential operator operates on the function x^5 as follows:

$$\frac{d}{dx}\left(x^5\right) = 5x^4$$

For example, a differential operator is used in the quantum mechanical Hamiltonian described in paragraphs [0139]-[0140] of the current application:

> The Hamiltonian in equation (36) can be modified to characterize the quantum behavior exhibited by atoms and molecules by substituting the differential operators:
>
> $$E \rightarrow i\hbar\frac{\partial}{\partial t}$$
>
> and
>
> $$p_k \rightarrow \frac{\hbar}{i}\frac{\partial}{\partial x_k}$$
>
> into equation (36) (*Quantum Mechanics*, Albert Messiah, Elsevier Science Publishers, The Netherlands, 1961). The resulting equation is the quantum, canonical, Hamiltonian operator given by:
>
> $$H\left(\boldsymbol{x}, \frac{\hbar}{i}\frac{\partial}{\partial \boldsymbol{x}}, \frac{\partial}{\partial t}\right) = \sum_k -\frac{\hbar^2}{2m_k}\frac{\partial^2}{\partial x_k^2} + V = i\hbar\frac{\partial}{\partial t} \qquad (37)$$
>
> that characterizes the behavior of a quantum mechanical system such as an atom or molecule. Equation (37) is called an "operator" because the kinetic energy and total energy have respectively been replaced by the differential operators given by:
>
> $$\frac{\partial^2}{\partial x_k^2} \text{ and } \frac{\partial}{\partial t}.$$

Applicants' representative believes that the claims 18-21, 25-27 are not anticipated by Colak because Colak does not expressly or inherently describe each and every element of the current application. The rejections of claims 19-21, and 25-27 depends from claim 18, and the subject matter to which these claims are directed is neither expressly or inherently described by Colak.

In Applicant's representative's opinion, all the claims remaining in the current application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

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AMENDMENTS TO THE DRAWINGS

Figure 11 has been amended to include elements 1114 and 1116, identified in redline. New formal drawings will be submitted.